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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/816,272	03/23/2001	Jun Murayama	450100-03079	7575

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EXAMINER	
TRAN, KHANH C	
ART UNIT	PAPER NUMBER
2631	

DATE MAILED: 04/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/816,272	MURAYAMA ET AL.	
	Examiner	Art Unit	
	Khanh Tran	2631	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 November 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *12-27* is/are allowed.

6)☒ Claim(s) *1-3,5-8,10 and 11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 November 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. The Amendment filed on 11/19/2004 has been entered. Claims 1-3, 5-8 and 10-27 are pending in this Office action.

Response to Arguments

2. Applicant's arguments, see page 14 under Remarks of the Amendment, filed on 11/19/2004, with respect to the rejection(s)of claim(s) 1-2, 5-7 and 10-11 under 35 U.S.C 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of admitted prior art, Rhines et al. US 5,392,299, and Nefedov US 2003/0118122 A1.

3. Objection of the Drawings has been withdrawn after drawings were amended to overcome the objection.

4. The objection of claims 13-14, 20-21 and 24-27 has been withdrawn after Applicants amended claims to correct informalities.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-3, 5-8, 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over admitted prior art in view of Rhines et al. US 5,392,299 and Nefedov US 2003/0118122 A1.

Regarding claims 1 and 6, as recited in previous Office action and repeated again, referring to admitted prior art figure 2, page 4 line 15 through page 6 line 10 of the original disclosure, the coding apparatus 201 for carrying out serially concatenated convolutional operation includes:

a convolutional coder 210, receiving 2 bits as input data D201, carries out convolutional operation whose code rate is "2/3" as coding of an outer code. The convolutional coder 210 corresponds to the claimed first coding means and the code rate "2/3", when generalized, corresponds to claimed code rate k / (k+1);

the interleaver 220 rearranges order of bits constituting the code data D202, which comprises 3-bit series output from the convolutional coder 210. The interleaver 220 corresponds to claimed first interleaving means;

the convolutional coder 230 carries out convolutional operation with respect to the interleaver data D203 of 3 bits as input data. The code rate is 1 with respect to data of 3 bits, corresponding to (k + 1) as claimed in the instant application. The convolutional coder 230 corresponds to the claimed at least one or more coding means serially concatenated with the later stage;

a multi-value modulation mapping circuit 240 maps data of 3 bits to a transmission symbol of 8PSK modulation system. The mapping circuit 240 corresponds to the claimed mapping means.

admitted prior art figure 2 lacks the claimed at least one or more interleaving means and a third coding means as set forth in the claimed invention.

Rhines et al. discloses in figure 2 a triple orthogonally interleaved error correction system includes an outer encoder 12, outer interleaver 16, a middle encoder, inner interleaver 110, an inner encoder 150, and a media channel encoder 160. Rhines et al. system has similar structure with additional second interleaver 110 and a third encoder 150. Rhines et al. system carries out serially concatenated coding operation. The encoders 12 90 150 shown in figure 2 are Reed-Solomon encoder, but Rhines et al. expresses that encoders 12 90 150 can be any other encoding system that generates and appends error detection and correction symbols, see column 9 lines 8-12, column 13 lines 5-12. Because convolutional coder is coding system for error detection and correction symbols, it would have been obvious for one of ordinary skill in the art at the time the invention was made that convolutional coders can be implemented in place of encoders 12 90 150 in Rhines et al. invention.

As expressly stated in column 4 lines 1-3 in Rhines et al. invention, the more error correction code symbols added to the data, the more accurate the ability of the system to detect and correct included error. As result of that, it

would have been obvious for one of ordinary skill in the art at the time the invention was made that admitted prior art can be modified to include a second interleaver serially concatenated with the convolutional coder 230 for interleaving order of bits constituting 3-bit data outputted from the convolutional coder 230, and a third encoder serially concatenated with the second interleaver to carry out coding in the final stage, the second interleaver and third encoder as taught by Rhines et al.. Regarding to code rate of the third encoder, as disclosed in admitted prior art on page 6 lines 4-10 of the original disclosure, the coding apparatus carries out convolutional operation whose code rate is "2/3", corresponding to the claimed k / (k+1), as coding of an outer code, and convolutional operation whose code rate is "1" as coding of an inner code to thereby carry out the serially concatenated convolution operation whose code rate is "2/3" as a whole. Because of the concept of keeping the code rate the same in inner coding as suggested by admitted prior art, therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made that the third encoder can be modified to carry out coding operation whose code rate is 1 as claimed in the instant application.

However, Rhines et al. does not teach a first interleaver and second interleaver being random interleaver as claimed in the application claim.

Nefedov teaches in figure 2 a system including an outer encoder 202 for encoding the digital information to be transmitted with an outer code, a pseudorandom interleaver 203 for interleaving the encoded digital information to

be transmitted, an inner coder 204 for encoding the interleaved encoded digital information with an inner code, and memoryless modulator 205 modulating the encoded interleaved encoded digital information onto a carrier. Rhines et al. invention differs from Nefedov invention in that Rhines et al. teachings utilizing triple orthogonally interleaved error correction code for detecting and correcting errors while Nefedov invention using double interleaved error correction code for detecting and correcting errors. In addition, Rhines et al. invention uses orthogonal interleaving algorithm while Nefedov invention employs pseudorandom interleaver. In column 2, lines 50-68, Rhines et al. discusses that it is well known in the art to interleaving process either before or after encoding to provide additional protection against included errors. Because pseudorandom interleaving algorithm is an alternative choice for performing interleaving, it would have been obvious for one of ordinary skill in the art at the time the invention was made that Rhines et al. outer and inner interleavers in figure 2 can be modified to operate in pseudorandom manner (e.g. pseudo random interleaver) as taught in Nefedov invention. The modification is obvious because Rhines et al. suggests that while the orthogonal interleaving alrorithm has been illustrated to provide interplane shuffling, it will be understood other interplane shuffling algorithms, e.g. in a *pseudo-random manner*, can be implemented.

Regarding claims 2 and 7, as discussed in claim 1, admitted prior art figure 2 teaches the coders 210 and 230 are convolutional coders. As recited in claim 1,

because the third coder as taught in Rhines et al. invention can be any other encoding system that generates and appends error detection and correction symbols, it would have been obvious for one of ordinary skill in the art at the time the invention was made that the third encoder can be implemented to be also a convolutional coder.

Regarding claims 3 and 8, Rhines et al. does not teach at least the middle encoder 90 and the inner encoder 150 (shown in figure 2) carrying out recursive systematic convolutional operation with respect to data input as claimed in the application claim. Nevertheless, Nefedov teachings apply to serially concatenated convolutional codes (SCCC). In paragraph [0005], Nefedov discusses that the known SCCC with interleavers yield superior performance to turbo codes, which are inherently systematic codes. Figure 2 utilizes a recursive inner encoder. As recited in claim 1, Rhines et al. expresses that encoders 12 90 150 (see figure 2) can be any other encoding system that generates and appends error detection and correction symbols, see column 9 lines 8-12, column 13 lines 5-12. In view of that, it would have been obvious for one of ordinary skill in the art at the time of the invention that middle encoder and inner encoder as taught in figure 2 of Rhines et al. invention can be modified to carry out recursive systematic convolutional operation with respect to data input as claimed in the application claim. As recited above, the known SCCC with interleavers yield superior performance to turbo codes, which are inherently systematic codes. Furthermore, Nefedov discusses in paragraph [0007] that it is known that to get

maximal performance, the inner encoder of serially concatenated convolutional codes should be *recursive*.

Regarding claims 5 and 10, as recited in claim 1, shown in admitted prior art figure 2, the mapping circuit 240 maps data of 3 bits to a transmission symbol of 8PSK modulation system.

Regarding claim 11, claim 11 has similar scope to that of claim 6 except in claim 11, a program code, stored in a recording medium controlled by a computer, is implemented to carry out the steps in the method of claim 6. As known in the art of digital signal processing (DSP) technology, it would have been obvious for one of ordinary skill in the art at the time the invention was made that the claimed steps can be easily programmed in a program code to be stored in a recording medium such as hard disk. The motivation is that the apparatus in the claimed invention is normally implemented on a DSP chip, which can be programmed to carry out certain functions. The DSP chip is programmable as appreciated by a person of average skill in the art.

Allowable Subject Matter

6. Claims 12-18 are allowed.

Regarding claim 12, said claim is allowed over the prior art of record because the cited references taken individually or in combination fail to particularly disclose the

claimed features "a second deinterleaver, a third soft-output decoding means, and a fourth interleaving means as set forth in the claim".

7. Claims 19-27 are allowed.

Regarding claims 19 and 26, said claims are allowed over the prior art of record because the cited references taken individually or in combination fail to particularly disclose the claimed features "a second deinterleaving step, a third soft-output decoding, and a fourth interleaving as set forth in the claim".

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

ten Brink U.S. Patent 6,611,513 B1 discloses "CDMA System With Iterative Demapping Of A Received Signal".

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh Tran whose telephone number is 571-272-3007. The examiner can normally be reached on Monday - Friday from 08:00 AM - 05:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone

number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KCT

Khanh Cong Tran 04/22/2005

Examiner KHANH TRAN